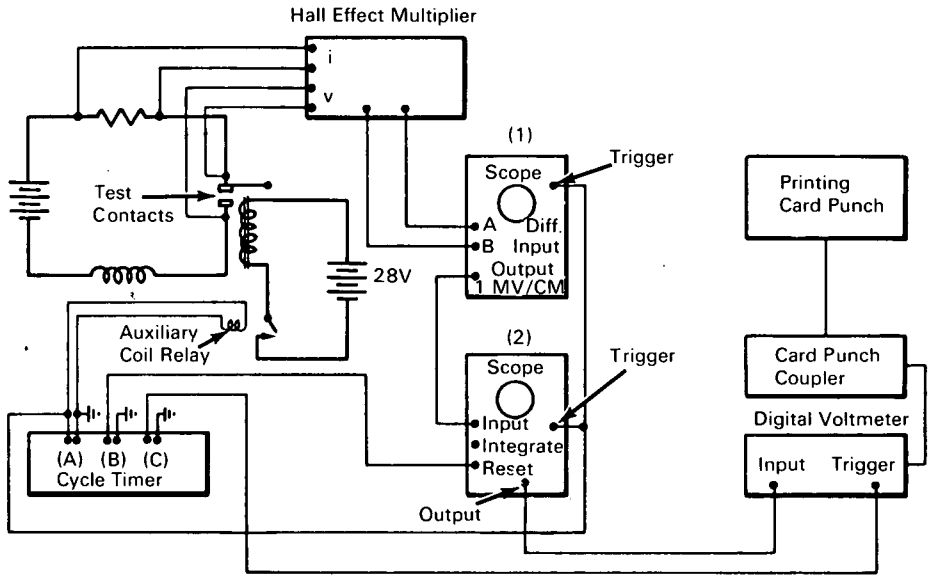
August 1968 Brief 68-10312

NASA TECH BRIEF

System Measures Arc Energy Dissipated in Relay Contact Cycling



A system has been devised for measuring the energy dissipated at the contacts of a relay operating in an electrical circuit. The system measures as well as records the energy for a large number of repetitive operations. It allows changes to be easily made in the cycle time, relay circuit parameters, and portion of the energy measured (i.e., the energy dissipated when opening the circuit, closing the circuit, or both).

The block diagram shows how the measuring system is set up. The cycle timer, which controls the operation of the entire system, consists of a motor-driven shaft with adjustable cams. The cycle time can be adjusted by changing the gear ratio; in addition, the duration and time of each switch closure is individually adjustable. The cycle timer may operate in conjunction with a 28-volt power supply to provide timed voltages as well as contact closures. For example, channel (A) of the timer supplies the voltage to energize an auxiliary relay whose contacts control the coil circuit of the relay under test. This auxiliary relay provides the following advantages: It prevents the large inductive voltage produced by the relay coil from being fed back into the system. It permits the use of an external power supply for the test relay coil, thereby preventing excessive transient loading of the cycle timer supply. The Hall effect multiplier produces a voltage which is proportional to the product of the instantaneous current and voltage (that is instantaneous power) at the contacts under test. The output of the multiplier is connected to the 1 mv per cm differential input of a specially modified oscilloscope (1). The scope has been modified to provide a low-impedance high-level output in addition to the visual display of instantaneous power. The output voltage

(continued overleaf)

from this oscilloscope is applied to the input of a controlled integrator (not shown) whose output is the instantaneous value of energy. A type O plug-in unit for the second oscilloscope (2) is fitted with a relay control circuit for this purpose. This relay is controlled by cycle timer channel (B).

The output of the integrator is displayed on the cathode ray tube of oscilloscope (2) and measured by a digital voltmeter. The diagram shows the connection of the cycle timer channel (C) to the digital voltmeter to trigger the measurement. When the portion of the energy to be measured has been integrated, the trigger input to the digital voltmeter is closed to ground. This initiates a 100 msec time interval during which the voltmeter measures the dc voltage at the output of the integrator. At the end of this measurement interval the voltmeter sends a pulse via the card punch coupler to a printing card punch which punches the value of the voltage in the card.

Note:

Inquiries concerning this system may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B68-10312

Patent status:

No patent action is contemplated by NASA.

Source: Oklahoma State University
under contract to
Marshall Space Flight Center
(MFS-14541)